

Education and the ethanol industry

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Abstract

Due to the rapid expansion of the ethanol industry, the need for producer training has grown as well. Training of plant individuals has always been valuable and available. However, due to the enormous growth, there is a lack of highly experienced plant personnel. The education of them is paramount in running a highly efficient and effective facility. General and enhanced training methods and courses will be discussed. Industry involvement in the education of its workers is relying more than ever on suppliers in order to take advantage of the process knowledge available. The ability to correctly implement this knowledge gives plants a tremendous advantage in this ever competitive field. Specific courses such as The Alcohol School provide this in depth knowledge and are an example of the education that is provided through particular suppliers. The importance of this growing need will be addressed and discussed to further the advancement of the industry.

La educación y la industria del etanol

Junto con la rápida expansión de la industria del etanol también ha crecido la necesidad de entrenar al productor. El entrenamiento del personal de la planta es valioso y siempre ha estado disponible. No obstante, como resultado del enorme crecimiento, hay una marcada falta de personal con suficiente experiencia. La educación del personal es de importancia primordial para un funcionamiento altamente eficiente y eficaz en las instalaciones. Se analizarán métodos de entrenamiento y cursos, generales y especializados. La participación de la industria en la educación de sus trabajadores depende más que nunca en sus proveedores para poder tomar ventaja de los conocimientos sobre el proceso, ya disponibles. La capacidad de poder implementar este conocimiento obtenido hace que las plantas adquieran una ventaja considerable en un área altamente competitiva. Cursos específicos tales como los de la Escuela del Alcohol proveen este conocimiento profundo y constituyen un ejemplo de la educación que es provista a través de ciertos proveedores. La importancia de esta necesidad en aumento será examinada y analizada para poder llevar aún más adelante el progreso de la industria.

Aus-/Fortbildung und die Ethanol-Industrie

Mit der rapiden Expansion der Ethanolindustrie hat auch die Notwendigkeit nach Schulung der Hersteller zugenommen. Schulungen für Anbauer waren schon immer nützlich und erhältlich. Doch aufgrund des enormen Wachstums besteht nun ein Mangel an wirklich erfahrenen Arbeitskräften. Ihre Ausbildung ist von entscheidender Bedeutung für den Betrieb einer effizienten und effektiven Einrichtung. In diesem Paper werden allgemeine und fortgeschrittene Schulungsmethoden diskutiert. Die Beteiligung der Industrie an der Ausbildung ihrer Arbeiter ist mehr denn je darauf angewiesen, dass Anbieter die zur Verfügung stehenden Verfahrenkenntnisse voll nutzen. Wenn die Fabriken diese Kenntnisse korrekt einsetzen, gibt ihnen das enorme Vorteile in diesem immer konkurrenzbetonen Bereich. Spezielle Kurse wie z. B. „The Alcohol School“ liefern solche gründlichen Kenntnisse und sind ein Beispiel der Aus-/Weiterbildung, die von bestimmten Anbietern bereitgestellt wird. Die Bedeutung dieser wachsenden Notwendigkeit wird angegangen und diskutiert werden müssen, um die Fortschritte des Industriezweigs weiter zu fördern.

Growth and educational need

The global ethanol industry has experienced unprecedented growth over the past few years. In both the United States and Brazil, the amount of ethanol produced has reached nearly 20 billion liters per year. Ethanol production capabilities are developing quickly in other parts of the world as well. The ethanol industry is truly becoming a global industry (table 1). Consumer awareness of ethanol has taken off like a rocket in the last year, as evidenced by the sudden increase in media coverage and advertising, newspaper editorials and letters to the editor, and consumer demand for flexi-fuel vehicles.

As the education of the consumer has slowly taken hold, industry worker education has grown as well. As a result of the unprecedented increase in ethanol production, there has been exponential job growth in this sector. In past years, when only a handful of new plants started production each year, the new plants were typically staffed with experienced personnel from nearby ethanol production facilities, who could easily 'back-fill' for the migrating employees. The sheer number of new plants, coupled with expansion of existing facilities, has stretched the availability of qualified, experienced manpower needed to run all of the production facilities. New plants are forced to hire inexperienced people to run their plants. Typically,

there are plenty of highly competent workers available from related industries, but they simply don't have ethanol production experience. Many ethanol producers are looking toward technical equipment and ingredient suppliers to help with training and education of their employees on the use of their products. A few of these suppliers are also being tapped as "industry experts" to help ethanol producers with comprehensive training on the ethanol production process.

Training by suppliers is nothing new to this industry; a number of suppliers have built training programs designed to help plant personnel understand what they have bought and how to utilize it in their plants. Companies supplying enzymes, plant engineering services, equipment (e.g., tanks, valves), and fermentation ingredients have included training services in the course of conducting their business. One company, Ethanol Technology, has had a very extensive training program in place since the company's inception. The training program is designed to educate in a general sense, yet provide the details and hands-on instructions required to actually run the fermentation area of the plant. For example, a general session in yeast training may be designed to help workers understand the biology and chemistry behind yeast and how this particular organism will work in general. Once workers understand what they are working with, they are more likely to be connected to the overall process, the big picture. It is similar to putting a face to a name that you have talked with many times but have never met. One of the goals in such training is to put that "face," so to speak, in front of the workers.

Of course, general education is necessary to get a foundation of knowledge. Another way to deliver and reinforce knowledge is in book form. The Alcohol Textbook, 4th edition, was published in 2003; the next edition will be published in 2008, with Ethanol Technology Institute and Scientific Director, Professor Mike Ingledew in the lead editing role. The Alcohol Textbook is a comprehensive reference book with chapters written by leading experts in the field, from both academia and industry. The book is designed to provide an understanding of the entire ethanol production process, from milling and mash preparation through fermentation and distillation. It provides the basics for many of the processes and situations that one may face in the daily operation of a plant.

Enhanced or targeted education

Once a basic educational foundation is achieved, education programs targeted to the individual's learning level can be very valuable. This is where the majority of the supplier training programs are focused. These sessions provide specifics on where and how to use products, how they work. For example, to liquefy starch into the proper dextrans to be available for fermentation, which enzyme should be used, and what are the critical process parameters? What type of yeast product and yeast management practice is best suited for the plant? What happens if the process parameters drift from high to low? All of these are pertinent questions that have to be dealt with in order for the plant to run effectively. The training courses at the plant level through key ingredient and equipment suppliers have been developed to give the answers to the particular product questions that come about. For example, a fermentation ingredient supplier is prepared to provide information and practical guidance with regard to yeast choice, yeast nutrition and antimicrobial control.

Technical ingredient suppliers, especially, are considered to be the industry experts in their particular field and are therefore expect-

Table 1. Annual world ethanol production by country (millions of gallons, all ethanol grades)

Country	2004	2005
Brazil	3,989	4,227
U.S.	3,535	4,264
China	964	1,004
India	462	449
France	219	240
Russia	198	198
South Africa	110	103
U.K.	106	92
Saudi Arabia	79	32
Spain	79	93
Thailand	74	79
Germany	71	114
Ukraine	66	65
Canada	61	61
Poland	53	58
Indonesia	44	45
Argentina	42	44
Italy	40	40
Australia	33	33
Japan	31	30
Pakistan	26	24
Sweden	26	29
Philippines	22	22
South Korea	22	17
Guatemala	17	17
Cuba	16	12
Ecuador	12	14
Mexico	9	12
Nicaragua	8	7
Mauritius	6	3
Zimbabwe	6	5
Kenya	3	4
Swaziland	3	3
Others	338	710
Total	10,770	12,150

Source: F.O. Licht

ed to pass their knowledge on to ethanol producers. However, as the industry is expanding, ethanol producers are looking at some supplier companies, to be "pseudo" experts in other areas of their plant as well. Expertise in areas such as distillation and grinding, in addition to fermentation management, is needed in the everyday running of a plant. Companies such as Ethanol Technology have hired experienced and highly educated technical people in order to fulfill these previously unexpected educational needs.

After plant and operations managers and their team of supplier educators have fulfilled the basic informational needs and provided a solid foundation of pertinent product information, what is needed to retain this knowledge? As part of a general operating philosophy, leading suppliers keep in regular communication with their customers to better understand their needs and gain insight into meeting those needs. Generally, re-education is needed, and often. With the

explosive growth of the industry, employee turnover in plants is quite high. The need for retraining is high as well. However, this also gives plant managers a unique opportunity to sink the knowledge in a bit further to existing employees as well. Many training seminars will have repeat attendees. Most plant operators have responsibility for a wide variety of areas. Re-training or constant education is something that will be highly beneficial in the long run for not only the individual, but for the plant as a whole.

Established programs and resources

One way to continuously keep on top of new developments is to conduct some basic library or internet research. In this day and age of electronic information, it is quite possible to obtain volumes of basic information. How to decipher that information is where your “experts” come into play. Another good way to keep up with the general happenings in the industry is to attend some of the conferences that are increasingly available to the industry. Most of the conference programmes contain a wide range of topics and speakers designed to enhance the general knowledge of the industry. Several conferences are more technical in nature and also provide networking opportunities with suppliers, academic researchers and industry peers.

Sometimes a more intensive educational experience is called for. Supplier training programs may not meet all of the needs of, for example, a new employee hired into a key technical position but lacking hands-on ethanol production experience, or a technician recently promoted to laboratory manager. Being a relatively young industry, formal ethanol production education opportunities at the secondary and post-secondary level have been quite limited to-date. A number of universities and community colleges are just now beginning to address this need. While the ethanol industry is considered to be a young industry, there is one educational programme that is in its 27th year. The Alcohol School is organized by the Ethanol Technology Institute and conducted twice each year. For 2007, The Alcohol School programmes were developed by one of the leading experts in fermentation, Professor W.M. (Mike) Ingledew from the University of Saskatchewan. The Alcohol School provides valuable

insights to both fuel ethanol and distilled beverage producers. The Alcohol School – Europe will be held this year in Toulouse, France (June 3-8) and Montréal, Canada will be the setting for The Alcohol School – North America (September 16-21). The programmes are designed for lab, plant and management personnel and are organized around lectures, laboratory demonstrations, seminars and plant visits. Lectures cover all aspects of production technology, with special attention to the fermentation process. Current technologies and new innovations are also discussed (see the box 1).

This educational vehicle provides the students with invaluable information and ensures they are aware of the latest trends and technological developments in the industry. To have many of the world’s leading producers, researchers, professors, and teachers in one place is unique in that one can take advantage of the years of knowledge all in one setting. This school setting has proved to be a very popular way of obtaining the proper knowledge as well as a forum for technical collaboration amongst ethanol producers. Another aspect of The Alcohol School is the interaction amongst the “experts” in the industry, in a relatively intimate setting of about one hundred students. Again, communication is the key to long lasting educational development.

The education of the ethanol industry is a global issue. Although the majority of the ethanol production is currently centered in the Americas, expansion of ethanol production in the rest of the world will likely lead to similar educational shortcomings that need to be addressed. There is a growing need for industry education in other parts of the world; ethanol industry development in Europe and Asia today resembles that of industry in Brazil and the United States ten years ago. Through increased consumer and facility education the industry development time gap will close considerably and the ethanol industry will flourish more as a whole than in parts. Education of the workforce will help to bridge that gap.

The need for educating the workforce in the ethanol industry is greater than it has ever been. The response of the “industry experts” will be severely tested but is absolutely key in the development and advancement of this industry.

Box 1 Course structure

The global beverage and fuel alcohol industry
 Dry milling of wheat, rye, barley and triticale
 Sugar beets, cane juice and molasses for fermentation
 Dry and wet milling of corn
 Enzyme applications in the production of ethanol from grain
 Yeast production, strains and formulations for fuel and beverage alcohol producers
 Yeast inoculation, nutrition and fermentation
 Stress management and control of yeast
 Propagators as used in fuel alcohol production
 Bacterial contamination and control
 Distillery cleaning and sanitation
 Mashing/fermentation in the potable distilling industry
 Beverage distillation-rye, rum and vodka
 Distillers grains in the nutrition of ruminants and other monogastric animals
 Perspectives on the future of alcohol production.

The Alcohol School 2007

